DEVICE FOR INTRODUCING A CATHETER WITH A SECURITY NON-PIERCING CAGE PROVIDED WITH A FLEXIBLE BLADE

[0001] The invention aims to eliminate the risks of accidental pricking on removal of a puncture needle employed for the insertion of a catheter into any part of the body through the skin.

[0002] A large number of such prick-prevention arrangements have been proposes for this purpose.

[0003] Publication FR 2 836 385 describes an arrangement in which whole needle with its base is trapped within a case after its removal.

[0004] Publications EP 0 554 841 and US 5 322 517 describe safety resources which include a cage to trap the point of the needle after its removal, where this cage contains a sprung steel blade which has a branch traversed by the needle, and another branch which is pre-stressed by the needle in an inactive position in which it bears laterally against the needle and which, in its active position, moves in front of the needle when this contact is removed due to withdrawal of the needle.

[0005] Publication EP 0 753 317 describes a cage which slides on the needle and which includes a sprung steel blade pre-stressed by contact with the needle in an inactive position for as long as the needle traverses the

cage, and which is freed and acts to divert the needle when the latter has entered into in the cage.

[0006] Publication US 5 447 501 describes an arrangement which includes a spring which is pre-stressed by the needle in an inactive position, and which diverts the needle when it is freed by withdrawal of the needle.

[0007] Other cage arrangements are also described in publications EP 0 456 694 (or US 5 322 517), US 623 499, US 5 176 655, and EP 0 891 198 (or US 6 001 080).

[0008] One objective of this present invention is to provide a simple cage and flexible blade arrangement, operating automatically, and in which the blade is not pre-stressed by the needle.

[0009] The invention concerns and arrangement for the insertion of a catheter into any part of the body, in particular a vein, through the skin, this catheter being equipped with a proximal base, where this arrangement includes a needle with a puncture end and also includes an anti-prick cage which extends the catheter base in the proximal direction, where this chamber forms a chamber through which the needle slides from a proximal entrance to a distal exit, and is equipped with sprung flexible steel blade to hold the puncture end of the needle in the chamber when the needle is withdrawn from the cannula, this blade

being positioned across the chamber close to the proximal entrance of the chamber perpendicular to the needle and traversed by the needle, with the blade and the needle including resources that combine so that the blade is at rest and traversed freely by the needle when the needle is pushed in the distal direction and so that the blade stops the needle, and is bent by the needle, when the needle is drawn in the proximal direction beyond a given axial position, so that the bent blade inclines the needle, and applies a return force to the needle which tends to force the needle back in the distal direction until the puncture end of the inclined needle comes up against a wall of the chamber.

[0010] In a preferred implementation, the flexible blade has a perforation for the passage of the needle, and the needle has a section of the needle modified locally so that it can be stopped by the perforation in the blade during the withdrawal movement of the needle, this modified section being located at a distance from the puncture end of the needle so that the contact of the modified section with the perforation in the blade occurs after this end has entered into the chamber during the withdrawal movement of the needle.

[0011] In preferred methods of implementation, the

invention also has one or more of the following characteristics:

[0012] - the chamber has an end wall in the distal direction which forms a groove in which the puncture end of the inclined needle lodges;

[0013] - ahead of the chamber, the cage has a nose which fits, without locking, into the catheter base, and which is traversed longitudinally by an aperture for the passage of the needle;

[0014] - the catheter base has an external rim, and the cage includes a device which has a dog which locks onto this rim for temporary attachment of the cage to the base;

[0015] - the dog comprises the end of a lever, and the flexible blade is shaped to operate by contact with this lever so as to free the dog from the rim of the catheter base when the blade has been sufficiently deflected.

[0016] The following description is of various implementations of an arrangement according to the invention for the insertion of a short catheter into a vein, with reference to the appended drawings in which:

[0017] - figure 1 shows, in longitudinal section, a first implementation, ready for use, with the flexible blade shown at rest;

[0018] - figure 2 shows the implementation of figure 1 during 30 two successive stages of the operation to withdraw the needle;

[0019] - figure 3 shows the assembly of figure 1 after separation of the cage and the cannula;

[0020] - figure 4 is a magnified view of a detail of the assembly of figure 2;

[0021] - figure 5 shows, in longitudinal section, an implementation variant of the assembly of figure 1, ready for use, with the flexible blade shown at rest;

[0022] - figure 6 shows the implementation of figure 5 during successive stages of the operation to withdraw the needle;

[0023] - figure 7 is a magnified view of a detail of the assembly of figure 6;

[0024] - figure 8 is a magnified view of the same detail, during a later stage of the withdrawal;

[0025] - figure 9 shows, in longitudinal section, another implementation of an assembly according to the invention, ready for use, with the flexible blade shown at rest;

[0026] - figure 10A is a view in perspective of an assembly according to figure 9, in which the base of the needle has been omitted, in which the assembly has been cut

in two by a longitudinal plane of symmetry, and in which the needle has been withdrawn until the point of the needle is on the point of emerging into the chamber of the cage;

[0027] - figure 10B is similar to figure 10A, during a later withdrawal stage, the point of the needle having arrived in the chamber of the cage, and the needle causing a deflection of the flexible blade;

[0028] - figure 10C is similar to figure 10B, during a later stage in which the flexible blade has been pushed back by the needle until the point of the needle comes up against the front wall of the chamber of the cage;

[0029] - figure 11 shows the assembly of figure 9 after 30 separation of the cage and the cannula;

[0030] - figure 12 is a magnified view of a detail of the assembly of figure 9;

[0031] - figure 13 shows, in longitudinal section, another implementation of an assembly according to the invention, ready for use, with the flexible blade shown at rest;

[0032] - figure 14 shows the implementation of figure 13 during successive stages of the operation to withdraw the needle;

[0033] - figure 15 shows the implementation of figure 13 after separation of the cage and the cannula, and

[0034] - figure 16 is a magnified view of a detail of the assembly of figure 12.

[0035] The figures show a cannula composed of a short tubular catheter (1) equipped with a proximal base (2), a needle (3) which has a puncture end (3a) and which is equipped with a proximal base (4), and an anti-prick cage.

[0036] The cage (5) forms a chamber (6) which has a proximal needle entrance (7) oriented toward the base of the needle, and an opposite end wall (8) which has a distal needle exit (9) oriented toward the catheter base.

[0037] Preferably, the end wall of the chamber forms a groove 20 around the exit from the chamber (10).

[0038] Ahead of the chamber, the cage includes a nose (11) which fits, without locking, into the catheter base, and which is traversed longitudinally by an aperture (12) for the passage of the needle.

[0039] The catheter base has an external rim (13), composed of one of the threads on the base for example, when the latter is threaded on the outside, and the cage includes a mobile dog (14) which locks onto this to hold the cage onto the base in a removable manner.

[0040] In the implementations of figures 1 and 5, the cage includes a sprung steel blade shaped as an L,

which has a longitudinal branch (16) fixed to a longitudinal wall of the chamber, and a flexible transverse branch (17) located close to the proximal entrance (7) of the chamber and equipped with a perforation (19) lined up with the exit (9) of the chamber when this flexible branch is at rest (figures 1 and 5) for the passage of the needle.

[0041] In a manner which is known of itself, the needle has a local change of section chosen so as not to compromise the sliding of the needle in the cannula while also being large enough to be stopped by the perforation (19) in the flexible branch of the blade which is located at the entrance of the chamber

[0042] In the implementations of figures 9 and 13, the flexible branch (17) is shaped as a U, constituting a rear transverse branch (17a) located to the entrance of the chamber and equipped with a perforation (19) for the passage of the needle, and a front transverse branch (17b) parallel to the first branch, located in the said chamber and equipped with a perforation (20) for the passage of the needle and sufficiently wide to also allow passage of the said modified section of the needle, while the perforation (19) stops this modified section. The perforations (19 and 20) are aligned with each other and aligned with the exit of the chamber when the flexible branch is at rest.

[0043] By way of guidance, and in no way limiting, two examples of such a modification have been shown which are known in themselves, namely respectively, a modification in the form of a local bulge (21) in the wall of the needle (fig.4) and a modification composed of a slot (22) in this wall (figs. 7 and 8). In the first case, the perforation (19) in the flexible blade can be merely cylindrical, while in the second case, the blade has claws (23) at the position of the perforation which are designed to bite into the wall of the needle.

[0044] In the first case, it can be seen that the needle will not be blocked in the blade and will still be able to slide in the distal direction (toward the front) while in the second case the needle will be blocked.

[0045] In all cases, the modification will be effected after threading of the needle.

[0046] This U-shaped blade guides the needle at two points and obliges it to assume the orientation imposed by the deviation of the blade.

[0047] In the implementations of figures 9 and 13, the cage includes a transverse plate (24) projecting laterally and against which presses one wall (25) of the base (4) of the needle when the needle is in its working position.

[0048] In the implementations of figures 9 and 13, the flexible blade (17b) is suspended by a branch (17d) turned onto the transverse plate (24) of the cage.

[0049] In the implementation of figure 13, in order to allow the separation of the cage from the catheter base, the dog (14) used for the temporary attachment of the cage to the base constitutes the end of a lever (26), and the flexible blade is shaped to operate by contact with this lever so as to free the dog from the rim of the catheter base when the blade has bent sufficiently. In the case presented as an example only, the flexible blade includes, for this purpose, a third branch (17c), which continues the second branch more or less at right angles to this branch, and which presses onto this lever to operate it when the blade bends.

[0050] The arrangement of figure 1 is applied as follows:

[0051] After effecting the vein penetration with the arrangement as shown in figure 1, the catheter is pushed toward the front into the vein while holding the needle, with the cage remaining attached to the catheter base and moving away from the base of the needle.

[0052] When the catheter is in place, the needle is drawn backwards while holding the catheter (fig.2), until

the bulge of the needle makes contact with the hole of the blade which it cannot cross.

[0053] By continuing the rearward traction on the needle, the blade is bent elastically and the bevelled end of the needle enters into the chamber. The deformation of the blade causes its hole to move off axis and as a consequence moves the needle off axis, this inclining within the chamber. By continuing the rearward traction, the cage is finally detached from the catheter base (fig.3).

[0054] The flexible blade then returns to its rest position and pushes the needle back by means of the bulge. The diverted bevelled end enters into the groove created around the exit of the chamber, where it is immobilised.

[0055] In the variant of figure 5, by drawing the needle to the rear, the slot in the wall of the needle is brought to the level of the claws of the blade. The claws dig into the latter and ensure axial immobilisation of the needle. By continuing the withdrawal movement of the needle, the blade is deformed, the cage separates from the cannula, and the blade returns to its original position. Even if the bevelled end were to succeed in recentring itself in the hole, the bevelled end will be blocked in the cage. A user who wanted to re-engage the bevelled end in

the distal exit of the chamber could not do so.

[0056] The implementation of figure 9 is used like the preceding implementations, and has the advantage of even greater safety due to the fact that the needle is guided by the two perforations in the flexible U-shaped blade, which combine to constrain it to incline when the blade is bent.

[0057] In the implementation of figure 13, the traction on the needle, blocked fully back in the chamber, leads to a rearward traction on the blade. When the puncture end of the needle is in the chamber, the retention dog is able to mount onto the collar of the base so as to escape to the rear, allowing the cage to separate from the base.

[0058] The invention is not limited to these examples of implementation.